REMARKS

I. STATUS OF THE CLAIMS

Claims 39-69 and 71-80 are pending in the application, of which claims 50, 51, 58, 63-67, 74, and 77-80 are withdrawn from consideration as being drawn to non-elected invention.

Claims 39 and 69 are independent claims, presently under examination.

Claims 39, 40, 42, 44, 45-49, 52-56, 62, 68, 69, and 71-73 stand rejected under 35 U.S.C. § 102.

Claims 41, 43, 57, 59-61 stand rejected under 35 U.S.C. § 103.

Claims 45-48, 50, 52 and 55 were rejected under 35 U.S.C. § 112(2). This cancellation was not made for the purpose of narrowing the scope of the claims.

II. INFORMATION DISCLOSURE STATEMENT

A. SUBMITTAL

Applicants wish to bring to the attention of the Examiner that an Information Disclosure Statement ("IDS") pursuant to 37 CFR § 1.97, is being filed concurrently herewith.

B. JOINT INVENTORS

Pursuant to the obligation under 37 CFR 1.56, Applicants concur with the Examiner's presumption that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made.

III. AMENDMENTS

The claim 68 has been amended. It is believed that the claims do not involve the addition of any new matter. A marked-up copy of the amended Claims are provided in Appendix A *infra*.

IV CLAIMS 45-48, 50, 52 and 55 ARE DEFININTE WITH THE MEANING OF 35 U.S.C. 112(2) IN VIEW OF THE AMENDMENTS TO THE CLAIMS AND BECAUSE THE CLAIMS APPRISE THOSE SKILLED IN THE ART OF THE SCOPE OF THE INVENTION.

Claims 45-48, 50, 52 and 55 are rejected under 35 U.S.C. 112, second paragraph. In particular, the Office Action states:

> Claim 45 is rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. In claim 45, "the data set" lacks antecedent basis. Claims 46-48, 50, 52 and 55 depend on claim 45 and also contain the phrase "the data set," hence review of these claims and amended as needed is suggested. Appropriate correction is required.

(See Office Action, par. 3, page 2)

Applicants have amended claims 68 so as to provide proper antecedent basis for "data set" for rejected dependent claims 45-48, 50, 52 and 55. This amendment was not made for the purpose of narrowing the scope of the claims. Applicants respectfully request that the Examiner's rejections of claim 45-48, 50, 52 and 55 under 35 U.S.C. 112(2) be withdrawn.

V. CLAIMS 39, 40, 42, 44, 45-49, 52-56, 62, 68, 69, AND 71-73 ARE NOT ANTICIPATED UNDER 35 U.S.C. § 102(b) BY GORDON ET AL. (US 4,862,361); AND CLAIMS 41, 43, 57, AND 59-61 ARE PATENTABLE UNDER 35 U.S.C. § 103 OVER GORDON ET AL. IN VIEW OF SCHROEPPEL (US 6,035,233) ET AL. BECAUSE THE APPLIED PRIOR ART AS A WHOLE FALIS TO SUGGEST THE APPLICANTS' INVENTON.

Claims 39, 40, 42, 44, 45-49, 52-56, 62, 68, 69, and 71-73 were rejected under 35 U.S.C. § 102(b) as being anticipated by Gordon et al U.S. Patent No. 4,862,361 (hereinafter "Gordon"); and claims 41, 43, 57, and 59-61 were rejected under 35 U.S.C. § 103 over Gordon in view Schroeppel et al U.S. Patent No. 6,035,233 (herein after "Schroeppel"). In particular, the Office Action states:

> Gordon et al. teach a critically ill child may exhibit marked changes in heart rate, read to be heart rate variability, indicative of a major unrecognized pathology. When a child has a myocarditis (an inflammation of the muscular walls of the heart incidental to systemic disease), low frequency heart rate fluctuations are seen (c 4, 1 54 – c 5, 17).

The systemic disease as disclosed by Gordon et al. may be a severe systemic infection (*c 26, 11 42-51); it is inherent that severe systemic infections significant for an infant or neonate include necrotizing enterocolitis, pneumonia, sepsis and meningitis.

In this invention, the R-R intervals are measured, collecting 1024 points (a ten to the third order data set), and third moment and higher data set is created by a microprocessor using the mean heart rate to calculate a "tachometer waveform" and by using the respiratory peak within a peak and judging the value against a value of two standard deviations from the mean. (c 5, 1 22- c 6, 1 7). A slew rate, read as the skew rate, is calculated using normalized data, a mean variance and a maximum of 10% of the heart rate waveform readings (c 16, 1 64 – c 17, 1 28). Stable and unstable graphic depictions of the parameters are shown in figures 10 and 11 (c 17, 11 29-41). Stable and unstable data sets graphically charted in figures 16, 17 and 18 show the distribution of heart rate variability data for 29 ill children monitored in a study (c 23, 11 35-51).

(See Office Action, par. 4, page 3)

The Office Action further states:

Claims 41, 43, 57 and 59-61 are rejected under 35 U.S.C. 103(a) as being unpatentable over Gordon et al. (US 4862361) in view of Schroeppel et al. (US 6035233). As discussed in paragraph 4 of this action, Gordon et al. discloses the claimed invention except for, upon identification of heart rate variability, providing a diagnostic work-up for the illness, including a blood culture or a pathological specimen, and antibiotics to treat the infection.

Schroeppel et al. disclose an implantable device responsive to heart rate variability and teach that, when heart rate variability is identified, it is known to selectively provide increasingly aggressive therapy regimes, beginning with a diagnostic work-up that would inherently include a blood culture and if additional signs of infection were present, such as an elevated temperature, a pathological specimen to identify any potential infection in the lungs or the spinal fluid. Drug therapy is a noted step in the therapy regime; antibiotics are inherent as the drug treatment for an infection (c 9, 11 3-45). Therefore it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the heart rate power spectral analysis as taught by Gordon et al., with diagnostic work-up for the illness, including a blood culture or a pathological specimen, and antibiotics as taught by Schroeppel et al. to enable diagnosis of the potential fatal illness so effective treat may be rapidly undertaken to optimize the patient chances for recovery.

(See Office Action, par. 6, pages 4-5)

Applicants respectfully traverse the rejection of claims 39, 40, 42, 44, 45-49, 52-56, 62, 68, 69, and 71-73 as being anticipated by Gordon; and submit that claims 41, 43, 57, and 59-61 would not have been obvious under 35 U.S.C. § 103 over Gordon in view of Schroeppel because the applied prior art fails to teach or suggest the following present invention:

i) A method for early detection of subacute, potentially catastrophic illness in an infant, as recited in base claim 1, which calls for:

(a) monitoring time series of RR intervals in the infant;

(b) identifying at least one characteristic abnormal pattern or distribution; and

(c) correlating the at least one abnormal pattern or distribution with said illness.

ii) An apparatus for early detection of subacute, potentially catastrophic infectious illness in a patient, wherein the patient is an infant, a newborn infant, a toddler, or a child, the apparatus, as recited in base claim 69, which calls for:

(a) a monitoring device, continuously monitoring time series of RR intervals in the patient; and

(b) a microprocessor, identifying at least one characteristic abnormal pattern or distribution in the RR intervals that is associated with the illness.

A. INTRODUCTION

For purpose of introduction of the prior art, Gordon teaches real-time monitoring of power spectra of heart rate time series. Whereas the present invention describes *inter alia* real-time monitoring of other kinds of mathematical analyses of heart rate time series. Unlike Gordon, the present invention analyses do not calculate modified or unmodified power spectra or any other frequency-domain parameter, and therefore uses entirely different mathematics and approach.

B. RECONSIDERATION

1. In particular, the Office Action (par. 4, page 3) states that Gordon discloses:

...a tachometer waveform and by using the respiratory peak within a peak and judging the value against a value of two standard deviations from the mean.

The Applicants' present invention neither calculates a tachometer waveform, nor does it calculate a respiratory peak to be judged against two standard deviations above the mean.

2. In particular, the Office Action (par. 4, page 3) states that Gordon discloses:

... the R-R intervals are measured, collecting 1024 points (a ten to the third order data set), and third moment and higher data set is created

The Applicants' submit that Gordon invention does not calculate third or higher moments of the heart rate data, as described in the present invention. The Gordon invention mentions calculations of the variance, or second moment, of the RR intervals (c16). This is exclusively in the context of correcting artifacts in the data, and not for interpretation of the clinical status of the patient as in the present invention.

3. In particular, the Office Action (par. 4, page 3) states that Gordon discloses:

... A slew rate, read as the skew rate, is calculated using normalized data, a mean variance and a maximum of 10% of the heart rate waveform readings (c 16, 1 64 – c 17, 1 28).

The Applicants' submit that the Gordon invention's artifact detection strategy mentions the slew rate of the heart rate series. This parameter has no relationship to the skewness of the RR interval histogram as described in the present invention. Contrary to the Office action, Applicants submit that slew rate can not be read as skew. Slew rate is used to correct artifacts prior to calculating the power spectrum.

In general, Applicants respectfully submit that paragraph 4 of the Office Action has been erroneously applied to the present invention. Moreover, the Office Action fails to correlate the applied references to the claimed elements. Applicants respectfully submit that the prima facie case of anticipation and obviousness has neither been presented nor achieved by the Office Action.

In view of the differences of base claims 1 and 69 and Gordon, Applicants respectfully urge that the rejections of 39, 40, 42, 44, 45-49, 52-56, 62, 68, 69, and 71-73 be withdrawn.

Moreover, the Examiner's reliance on Schroeppel does not supply the deficiencies of the Gordon disclosure vis-à-vis Applicants' claims 1 and 69. A dependent claim contains all the limitations of the intermediate claim upon which it depends and is non-obvious under Federal Circuit guidelines if the intermediate claim upon which it depends is allowable. Hence, it is the Applicants' position that the cited art as whole fails to teach or suggest the claimed invention

within the meaning of 35 U.S.C. § 103 and request that the rejection of claims 41, 43, 57, and 59-61 be withdrawn.

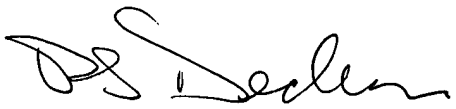
VI. CONCLUSION

For the foregoing reasons, Applicants respectfully submit that claims 39-62, 68, 69, and 71-76 are in condition for allowance, and a notice for allowance is solicited. Should questions arise during examination, the Examiner is welcome to contact the Applicants' attorney at the telephone listed below.

Please charge any excess fees due and credit any overpayment to Charge Account No. 50-0423.

A marked-up copy of the amended Claims is provided in the Appendix A *infra*.

Respectfully submitted,



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Appendix A

Marked-up Copy of Amended Claim (68)

68. (Twice amended) The method of claim 39, wherein the at least one characteristic abnormal pattern or distribution is identified from a **data** set of RR intervals.